His letters do not, I think, entitle him at present to be placed in the category of benefactors, because his checking is unsound and his theory is out of date. Even if he had succeeded in what appears to be his immediate object, and had cooked the forecaster's goose, it would have made a sorry meal. Those who are acquainted with the history of meteorology in this or any other country know that whatever may be the merits of the bird herself, as long as she lives she may lay golden eggs which are very sustaining for the progress of science.

Official forecasts for twenty-four hours in advance are often right and sometimes wrong, but the study of the daily weather by means of maps has a fascination which increases year by year as the observations become more precise and the area covered becomes wider and wider. "Age cannot wither nor custom stale its infinite variety." The subject is so complex and so varied that it is mere vanity to think of taking up the whole of it at once and producing a complete solution applicable to the whole of time. We must take the pieces which our intelligence, such as it is, enables us to tackle. Quite apart from the practical utility to the public, of which others must judge, and which is not quite a single-valued function of accuracy, the daily forecast is absolutely indispensable for the student of atmospheric physics. The daily map serves also a variety of useful public purposes of which the forecasts are only one.

Notwithstanding Mr. Mallock's theory, the forecasts for twenty-four hours are gradually getting more accurate; but, even if his contention were valid, I should still ask to be allowed to continue the study of the daily observations, as my predecessors did from 1867 to 1879, when the issue of forecasts was, once before, suspended in deference to the representations of the learned.

W. N. Shaw.

June 5.

Cellular Structure of Emulsions.

The letters and photographs published on this subject do not make it quite clear whether the cellular structure observed is confined to the surface, or exists in the interior of the emulsion. Superficial cellular structure is by no means uncommon, and is shown to advantage by thin layers of heavy tar-oil or benzaldehyde on the surface of water. If the phenomenon under discussion is restricted to the surface, it probably falls, as suggested by Mr. Harold Wager, under the heading of the "cohesion figures" first studied by Tomlinson. If, however, the cellular structure extends throughout, some further explanation is necessary, and it would be interesting to know whether any such cases have been observed.

Chas. R. Darling.

City and Guilds Technical College,
Finsbury, E.C.

β and γ Rays and the Structure of the Atom (Internal-Charge Numbers.)

In a previous letter to Nature (December 25, 1913, p. 477) it was suggested that "a cluster of α particles *only* may be at the centre of the atom," and that, though the innermost electrons "may have no influence at all on the properties of the elements, and for an electron (or α particle) penetrating from without will belong to the nucleus (see Nature, November 27, 1913, p. 372), a β particle ejected from near that cluster must pass all other electrons and excite radiation different for each, as dependent on the (successively changing) charge within."

The word "ring" has here been purposely omitted; for from the wave-lengths of the soft γ rays (L radiation) of radium B (Rutherford and E. N. da C. Andrade, *Phil. Mag.*, vol. xxvii., 1914, p. 861), and of the β-ray spectrum of this substance (Rutherford and Robinson, *Phil. Mag.*, vol. xxvi., 1913, p. 724), it may be seen that these frequencies are nearly equal to the square of (probably all) integers from P, the periodic number to A/2, half the atomic weight, multiplied by a constant ($3{\cdot}942 \times 10^{14}$/sec.), and that the β-ray spectrum contains only velocities equal to (probably all) integers from P to A/2, multiplied by a constant ($3{\cdot}175 \times 10^{8}$ cm./sec.), so that all the radii of the inner electrons should be different, and these electrons must "be moving in a manner prohibiting any two of them from forming a ring," but not "either form a single ring or rings in parallel planes" (J. W. Nicholson, Nature, May 14, p. 268, and *Phil. Mag.*, April, 1914, p. 557, respectively), forming a "planetary" rather than a "Saturnian" atom. (P = the periodic number = the number of peripheric electrons; see Nature, December 25, 1913, p. 477, and March 5, 1914, p. 7, and the periodic system in Table II.)

Table I.

I.	II.	III.	IV.	V.	VI.
Charge	$\lambda.10^8$	$\sqrt{\nu}.10^{-9}$	N_γ	β	N_β
107—99	—	—	—		
98	0·793	1·945	98·0		
97	0·809	1·926	97·0		
96	—	—	—		
95	0·838	1·892	95·3		
94	0·853	1·877	94·5		
93	—	—	—		
92	—	—	—		
91	0·917	1·809	91·1		
90	—	—	—		
89	0·953	1·773	89·3		
88	0·982	1·748	88·0		
87	1·006	1·727	87·0		
86	1·029	1·708	86·0		
85	1·055	1·687	85·0		
84	1·074	1·670	84·1		
83	1·100	1·650	83·1		
82	1·141	1·620	81·6		
81	1·175	1·597	80·4		
80	1·196	1·583	79·8		
79	1·219	1·569	79·0		
78	1·266	1·539	77·5	0·823	77·8
77	1·286	1·528	77·0	—	—
76	1·315	1·510	76·0	0·805	76·0
75	1·349	1·490	75·0	0·797	75·3
74	1·365	1·482	74·6	0·787	74·4
73				—	—
72				0·762	72·0
71				0·751	71·0
70				—	—
69	Faint lines.			0·731	69·1
68				0·719	68·0
67				—	—
66				0·700	66·1
65				—	—
64				—	—
63				—	—
62				0·656	62·0
61				—	—
60				0·635	60·0

I. The possible charges for each electron.
II. The wave-lengths of the γ rays of RaB.
III. The square root of these γ-ray frequencies.
IV. The possible charges calculated from III.
V. The velocities of the so-called β rays of RaB.
VI. The possible charges calculated from V.

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From the K radiation lines (Moseley, *Phil. Mag.*, April, 1914, p. 706), the very penetrating γ rays of radium B may be expected to have frequencies equal to the square of (probably all) integers from $P=60$ to $A/2=107$, multiplied by $2{\cdot}48\times10^{15}$/sec. Hence for uranium frequencies up to $2{\cdot}85\times10^{19}$/sec. might exist. Of course, on this view different elements must have partly equal β and γ rays, and the so-called β-ray spectra be those of electrons expelled by the β particle, and not of the β particles themselves.

As "there is also a large group of faint lines between 14° and 22° which do not permit of accurate measurements" (*loc. cit.*, p. 859), it may be observed that 22° corresponds to a charge of 64, so that all lines fall within the limits given above.

TABLE II.—*The "Condensed" Periodic System with* (1–70) *the Periodic Numbers.*

							0H—He
1Li	2Be	3B	4C	5N	6O	7F	8Ne
9Na	10Mg	11Al	12Si	13P	14S	15Cl	16Ar
17K	18Ca	19Sc	20Ti	21V	22Cr	23Mn	24Fe—Co—Ni
25Cu	26Zn	27Ga	28Ge	29As	30Se	31 Br	32Kr
33Rb	34Sr	35Y	36Zr	37Nb	38Mo	39—	40Ru—Rh—Pd
41Ag	42Cd	43In	44Sn	45Sb	46Te	47I	48Xe
49Cs	50Ba	51La, etc.	52, etc.	53Ta	54W	55—	56Os—Ir—Pt
57Au	58Hg	59Tl	60Pb	61Bi	62—	63—	64Nt
65—	66Ra	67Ac	68Th	69—	70Ur	71—	72— — —

It would seem that there is no reason, why such a structure, though not observable by lack of γ radiation, should not belong to all elements. But it is perhaps not compatible with Bohr's atomic model. With Moseley's formula for the L radiation $A(N-7{\cdot}4)$ it is not; but if here $(N-7{\cdot}4)$ be multiplied by 1·008, all values for $(N-7)$ are integers $(\pm0{\cdot}2)$ also, and the same holds for all Moseley's series, so that, if $N=M$, $\nu=A(M\pm n)$, and n is any number of electrons between certain limits.

A. VAN DEN BROEK.

Gorsel (Holland), May 19.

FORESTRY AND FOREST RESERVES IN NEW ZEALAND.[1]

THE recently-published report of the New Zealand Commission on Forestry contains much that is of general interest, apart from the aspects of the forestry problem affecting that Dominion in particular. New Zealand has magnificent forests, especially of conifers and southern beeches, with a present area of about twelve million acres. The forest area has been reduced by nearly one-half since about 1830, and during the last ten years the annual cut has doubled, so that despite the steps that have been taken since about 1875 to prevent waste and to afforest suitable areas, the forest capital is dwindling at an alarming rate.

Since the New Zealand forest flora includes a number of species which are of unusual interest as representing the most primitive types of gymnosperms, particularly among the families Araucarineæ and Podocarpineæ, it is gratifying from the botanical as well as from the economic point of view that vigorous steps are now being taken by the Dominion Government to conserve the native trees, as well as to inaugurate a far-reaching scheme of afforestation. Of the endemic trees, the "Kauri pine" (*Agathis australis*) is among the most valuable timbers of the world, and though it is still fairly abundant, its distribution is limited to the northern portion of the North Island, it is very inflammable, and it takes from six hundred to about three thousand years to attain its full size. Besides yielding the valuable copal-like resin which is largely exported to the United States and to this country, the Kauri produces timber which is unrivalled for shipbuilding and for other purposes to which it is adapted, owing, above all, to its freedom from knots—a condition secured through the function of an absciss-layer causing self-amputation of branches. The other New Zealand conifers, including timber trees of great value, also suffer, though in a smaller degree, from this drawback of slowness of growth, and it is therefore necessary to plant introduced trees which are found to grow four to ten times as rapidly as the native species.

As we learn from this report, the forestry problem is being faced in a systematic manner by the New Zealand Government, and forestry promises to develop into one of the most important and permanent industries of the Dominion, which, though precluded by its geographical position from becoming to any appreciable extent a contributor to the world's supply of timber, can, at any rate, meet its own wants, and probably continue in an increasing degree to assist Australia, where the shortage of structural (coniferous) timber is now leading to a steady annual rise in the amount imported from Europe and North America, as well as from New Zealand. About 60,000 acres have already been afforested, but this will be greatly increased in the near future, since it is estimated that at the present rate of consumption the indigenous forests will be exhausted in about thirty years.

While much of the report is, naturally, concerned with the special needs of New Zealand—a large section being devoted, for instance, to the question of suitable wood for butter-boxes, in view of the important and increasing dairy industry—there are various matters of general interest, among which we may note particularly the formation of climatic and scenic reserves.

A climatic reserve may be defined as a nature reserve selected for the purposes of protection of soil, prevention of denudation, water conservation, prevention of floods, and shelter from winds. In relation to its area, few countries in the world are in greater need of an adequate forest covering

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[1] Report of the Royal Commission on Forestry. (Wellington, New Zealand: John Mackay, Government Printer, 1913.)
Report on Scenery Preservation. New Zealand Department of Lands. (Wellington, 1912.)

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